Remarks

Claims 1-16 are now in the case for examination.

Support for the amendments to the claims can be found at page 3, lines 2-3, and page 9 lines 6-8.

Regarding the Examiners comments concerning a proper information disclosure statement, the Applicants will review the information available to determine if a separate information disclosure statement should be filed.

Formal drawing will be prepared and submitted after a Notice of Allowance is received for this application.

The objection to the specification, specifically, the paragraph beginning on line 15 of page 13 has been overcome by the above amendment.

The objection to claim seven has been made moot by the amendment of the claim.

The rejection of claim 1 under 35 U.S.C. § 103(a) for being unpatentable over Kroneisen et al., U.S. Patent No. 4,410,854, in view of Collings et al., U.S. Patent No. 5,073,753 and Kostiuk et al., U.S. Patent 5,588,825, is respectfully traversed.

The Applicants note that the Examiner refers to Koroneisen et al. on pages four and five of the office action. The Applicants presume that the Examiner is referring to Kroneisen et al. referred to hereinabove. If another patent is indeed being raised as prior art, the Applicants request a copy of the reference so that it can be evaluated.

The Applicants' invention is directed to an apparatus for the monitoring and control of the combustion process in the burner assembly of a combustion system. The Applicants' apparatus monitors, in real-time, the combustion of a hydrocarbon-based fuel and controls the combustion process by monitoring the level of current conducted through the flame and, in turn, adjusting the fuel supplied to the burner. Typically, this burner is part of a gas turbine, however, it may be used in other commercial burners. The Applicants' invention is not directed to the analysis or measurement of the carbon content of an exhaust gas stream.

Kroneisen is directed to an improved flame ionization detector for measuring the carbon concentration of gas fuel in an exhaust gas mixture. As Kroneisen states, the detector of this type could; "be used for measuring the concentration of carbon in hydrocarbons contained in the exhaust fumes for combustion engines" (Col 1, lines 19-21). Kroneisen asserts that the

disclosed detector will provide more stable measuring results. In particular, Kroneisen is directed to a "detector which is sufficiently accurate so that carbon equivalent of any and all hydrocarbons in the measuring gas can be detected at an error rate not greater than ± 5% in relation to the absolute content of such hydrocarbon of hydrocarbons within a range of concentration of not greater that 10% methane equivalent." The Kroneisen patent is directed to the determination of the carbon equivalent of a measuring gas by combusting the measuring gas in the detector with a fuel, typically hydrogen, and air. The Kroneisen patent specifies low gas flow rates (2-10 milliliters/minute) and specific nozzle geometries for the detector. Further, Kroneisen is used with a measuring gas containing less that 10% methane or its equivalent. Kroneisen does not disclose or suggest the combustion of a hydrocarbon fuel in the burner of a combustion system. Further, Kroneisen does not disclose an apparatus for the monitoring and control of the combustion process in the combustion zone of a burner.

The Applicants argue that the disclosed device of Kroneisen is directed to an analytical or test device for accurately detecting the carbon equivalent of hydrocarbons in a measuring gas. The Kroneisen patent describes a standalone unit wherein the hydrocarbon sample, or measurement sample, is extracted from a system containing unburned hydrocarbon and supplied to the FID at a limited rate. The measurement sample is typically burned using a hydrogen flame (Column 2, line 37), and not by relying on the hydrocarbon fuel source itself to support combustion, as does the Applicants' invention. In a manner similar to the instant apparatus, the current measured through the flame is an indicator of the hydrocarbon concentration. In Kroneisen et al, the flow of hydrogen, air, and sample gas (which is of certain hydrocarbon concentration) is limited within a select range. In the device of Kroneisen the flow of the gases is limited within a range in order that the hydrocarbon concentration can be accurately determined using the measured current. As opposed to, the instant invention (CCADS) of in-situ monitoring, wherein we claim that one can control the air and/or fuel using the CCADS measurement (Claim 7). In the CCADS the Applicants are establishing a certain current through the flame by adjusting the air, and/or fuel. This claim, for example, allows for combustion systems using adjacent burners as part of a large industrial system such as a gas turbine to basically balance the combustion process in the local combustion zone throughout the system by using this relative signal and adjusting the air, and/or fuel. Furthermore, in the embodiments, disclosed by the Kroneisen patent, call for specific spacing of the electrode and the second electrode location in the combustion zone (col 2, lines 1-5). The Applicants'

apparatus does not require the critical dimensions or choice of materials as Applicants' device is designed to be used in the high temperature environment of a combustion burner. Therefore, the Applicants' argue that their invention of claims 1-16, as now claimed, is clearly novel, unobvious, and therefore clearly patentable over Kroneisen.

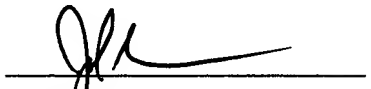
Collings et al., like Kroneisen is directed to detection of unburnt hydrocarbons in the exhaust gases from an internal combustion engine. Collings, like the aforementioned reference, utilizes hydrogen or another fuel to combust the hydrocarbons in the sample gas. Further, the detector of Collings operates under control gas flow conditions and apparatus geometries. Collings do not disclose or suggest an apparatus for the monitoring and control of the combustion process in the burner assembly of a combustion system. Further, Collings does not disclose an apparatus having a combustion system comprising a fuel nozzle having an outer shell in fluid communication with the fuel nozzle, a means for supplying a hydrocarbon-based fuel to the fuel nozzle at a rate; a means for supplying an oxidizer to the fuel nozzle at a rate; a means for igniting the hydrocarbon fuel and oxidizer thereby initiating the combustion process, the products of which comprises hydrocarbon ions; a sensor positioned within the combustion system, said sensor including a first electrode and a second electrode in spaced-apart relationship of the first electrode, wherein at least a portion of the combustion process takes place between the first and second electrodes; and a means for measuring the current induce thought the combustion zone.

Applicants' apparatus is directed to the *in situ* monitoring and control of the combustion process in the combustion zone of a burner of a combustion system while the combustion process is taking place. Clearly, the Applicants' monitoring system is unobvious over Kroneisen and Collings, as these references are directed to the analysis of the off gases of an internal combustion engine. Therefore, the Applicants' argue that their invention of claims 1-16, as now claimed, is clearly novel, unobvious, and therefore clearly patentable over Kroneisen.

Kostiuk et al. is directed to a lean premix fuel burner. Kostiuk is not directed to the monitoring and control of the combustion process. Further, there is nothing within the disclosures of Kroneisen and Collings to combine the combustion product monitoring of these references with Kostiuk. Absent the instant application there is no basis within the references for combining the references as suggested by the Examiner. Therefore, the Applicants maintain their position that the Applicants' apparatus as now claimed, in claims 1-16 is novel and unobvious over Kroneisen in view of Collings and Kostiuk.

The Applicants believe that the application, including claims 1-16, is now in allowable form. Allowance is therefore respectively requested.

Respectfully submitted,



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